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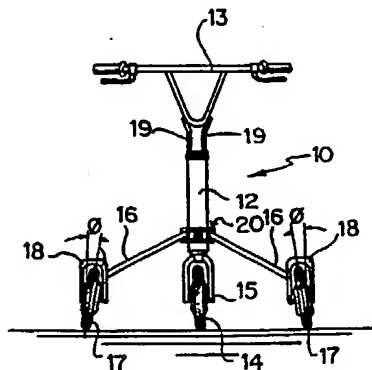
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(21) International Application Number: PCT/BR91/00011 (22) International Filing Date: 1 July 1991 (01.07.91) (30) Priority data: PI 9003238 29 June 1990 (29.06.90) BR (71)(72) Applicant and Inventor: VENDRAMI TRENTINI, Luiz, Osório [BR/BR]; Rua José Flori, N° 400, Pilarzinho, 80000 Curitiba, Paraná (BR). (74) Agent: DANNEMANN, SIEMSEN, BIGLER & IPANEMA MOREIRA; Rua Marquês de Olinda, N° 70, Botafogo, 22251 Rio de Janeiro, RJ (BR).		(81) Designated States: AT, AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CI (OAPI patent), CM (OAPI patent), DE, DE (European patent), DK, DK (European patent), ES, ES (European patent), FI, FR (European patent), GA (OAPI patent), GB, GB (European patent), GN (OAPI patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL, NL (European patent), NO, PL, RO, SD, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US. Published With international search report.

(54) Title: CAMBERING SCOOTER AND SYNCHRONIZING MECHANISM THERETO



(57) Abstract

A cambering scooter is provided, of the type comprising a substantially upwardly extending main frame (12) having a pair of substantially horizontal twisting arms (16) extending rearwardly therefrom; a front wheel (14) attached to the said main frame (12) and a pair of rear wheels (17), each attached to one of said twisting arms (16) at their ends opposite to the main frame (12); a handle bar (13) associated to the said main frame (12) to allow an operator to rotate the same together with the front wheel (14) attached thereto about the longitudinal axis of the main frame, thus guiding the scooter; and a synchronizing mechanism (20, 40) for fixing the said twisting arms (16) to the main frame (12), so that the twisting arms (16) are free to pivot at least in one direction around their points of connection with the said main frame. This type of cambering scooter has the advantage that a great percentage of the force supplied by the operator is lost due to construction problems. The present invention obviated those problems by providing a scooter wherein the central axis (15) of the said front wheel (14) is located behind the longitudinal axis of the main frame (12), with regard to the length of the scooter; and the said handle bar (13) is located in a plane ahead of the main frame (12) with regard to the normal direction of movement of the scooter. An improved performance is obtained with the construction of the present invention. A synchronizing mechanism (20, 40) for a cambering scooter of this type is also provided by the present invention.

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Title: Cambering scooter and synchronizing mechanism thereto

The present invention refers to a laterally twistable three wheeled vehicle or cambering scooter, of the type in which the user stands on two platforms over the rear 5 wheels, holding the handle bar, which is, in turn, connected to a front wheel.

The movement of this kind of vehicle is basically made, as it is well known from the state of the art, by the user inclining his body alternatively from one side to the 10 other, thus transferring his weight from one side of the vehicle to the other respectively, with this kind of movement resulting in an almost "sinusoidal" path of the vehicle caused by the difference of radius of the curves made by the two rear wheels, thus transforming the angular moment which results 15 from the operator's weight associated with the said difference in the radius in forward movement.

The state of the art which is pertinent to this invention, as far as the applicant is aware, is represented by the following references, which are hereby incorporated in the 20 present specification:

- Brazilian patent application PI 8901011, filed on March 01, 1989, in the name of Luiz Osório Vendrami Trentini.
- Brazilian patent application PI 8800877, filed on February

25, 1988, in the name of Luiz Osório Vendrami Trentini.

- Brazilian Patent Application MI 4800219, filed on February 28, 1988, in the name of Luiz Osório Vendrami Trentini.
- US 3,229,782 granted to R. D. Hilton
- 5 - US 4,087,104 granted to Winchell et all
- US 4,087,106 granted to Winchell
- US 4,087,107 granted to Winchell
- US 4,133,551 granted to Biskup

The vehicles of this type, as known from the state of the art,
10 present several problems with regard both to its construction
and to its operation, as follows:

- 15 a. The force which is made by the operator is not totally converted into movement of the vehicle, with losses occurring due to the mounting of the front wheel, the geometry of the rear wheels, the position of the handle bar with regard to the upright main frame, as well as the construction of the device which synchronizes the relative movement between the two rear wheels, or the way in which the two twisting arms having attached thereto the rear wheels are connected to
20 the said upright main frame.
- b. The said connection of the twisting arms to the upright main frame in the prior art vehicles, besides causing losses in the operator's force, is made of several pieces and is complicated and expensive in construction.

The front wheel, in the vehicles of the prior art, has the sole function of guiding the vehicle and has no influence in the accelerating characteristics thereof.

US 4,087,104 and US 4,087,106, for example, teach a
5 synchronizing mechanism for the rear wheels which is made of several pulleys and steel wires and which presents a small strength in spite of its complexity and heavy construction. US 4,087,107, on the other hand discloses a synchronizing mechanism made of a number of rigid elements
10 (40,42,68,70,66,82,84) which are of extremely heavy, complicated and expensive construction.

US 4,133,551 to Biskup teaches a synchronizing mechanism having a much more simple and elegant construction, but which suffers from the serious disadvantage of being fragile
15 in a long term use, in that all the forces generated by the movement of the operator's body, plus those generated by the pivoting movement of the twisting arms (30,32) are concentrated solely in a few points of the mechanism. Moreover, this mechanism also comprises several pieces and is expensive to
20 manufacture.

The first objective of the present invention is to provide a cambering scooter which obviates the above cited problems of the prior art vehicles, and the second objective of the invention is to provide a synchronizing mechanism for
25 the twisting arms of this type of vehicle, which is of a simple and unexpensive construction.

The first of those objectives was reached in the present invention by the provision of a cambering scooter comprising a substantially upwardly extending main frame having a
30 pair of substantially horizontal twisting arms extending rearwardly therefrom; a front wheel attached to the said main frame and a pair of rear wheels, each attached to one of said twisting arms at their ends opposite to the main frame; a handle bar associated to the said main frame to allow an operator
35 to rotate the same together with the front wheel attached thereto around the longitudinal axis of the main frame, thus guiding the scooter; and a synchronizing mechanism for fixing the said twisting arms to the main frame, so that the twisting arms are free to pivot at least in one direction around their

points of connection with the said main frame; characterized in that the central axis of the said front wheel is located behind the longitudinal axis of the main frame, with regard to the length of the scooter; and the said handle bar is located in a plane ahead of the main frame with regard to the normal direction of movement of the scooter.

Preferably, the two rear wheels are inclined with regard to the plane of the front wheel, in an upwardly convergent manner.

10 The second of those objectives was reached in the present invention by the provision of a synchronizing mechanism for attaching the twisting arms to the substantially upwardly extending main frame of a cambering scooter of the type in which the said twisting arms extend rearwardly from
15 the main frame, which, in turn, has attached thereto a front wheel while each of said twisting arms has attached thereto a rear wheel, characterized in that the said synchronizing mechanism has a general "H" configuration, with its cross bar being provided with connecting means for cooperation with a
20 corresponding connecting means in the main frame, and a portion capable to engage the said twisting arms, to limit their movements with respect to the said main frame and to synchronize the movement of one twisting arm with regard to the other.

25 The present invention will now be described with regard to preferred embodiments thereof illustrated in the attached drawings, in which:

Figure 1 is a side plan view of a scooter according to the prior art;

30 Figure 2 is a cross section view of the main frame of a cambering scooter according to the present invention, showing a first embodiment of the synchronizing mechanism of the twisting arms, having its pivot axis located in a plan ahead of the main frame;

35 Figure 3 is a cross section view of the synchronizing mechanism taken along lines III-III of figure 2;

Figure 4 is a plan view of the first embodiment of the synchronizing mechanism, shown in figures 2 and 3;

Figure 5 is a cross section view, taken along lines

V-V of figure 4;

Figure 6 is a cross section view taken along lines VI-VI of figure 3;

Figure 7 is a top plan view of the synchronizing mechanism, similar to figure 2, but with the pivot axis of the synchronizing mechanism being located in a plan behind the main frame;

Figure 8 is a view a cross section view taken along lines VIII-VIII of figure 7;

10 Figure 9 is a view similar to those of figures 2 and 7, but showing the pivot axis of the synchronizing mechanism located in the same plan of the main frame;

Figure 10 is a side view, partially cut, of the synchronizing mechanism illustrated in figure 9;

15 Figure 11 is a side view of a cambering scooter according to the present invention, in a folded position ready for being transported;

Figure 12 is a detail of the position of the axis of the front wheel with regard to the longitudinal axis of the 20 main frame;

Figure 13 is an upper view of the scooter of the preceeding figures;

Figure 14 is a side view of a scooter according to the present invention, showing the position of the handle bar 25 with regard to the longitudinal axis of the main frame;

Figure 15 is an scheme showing the curve described by the handle bar, when rotated by an operator;

Figure 16 is a rear view of the scooter of the present invention showing the inclination of the rear wheels, with 30 regard to the plane of the front wheel;

Figure 17 is a view showing the scooter inclined to the left;

Figure 18 is a front schematic view of the main frame, showing the position of the two pivot axis, parallel to 35 each other, in a second embodiment of the synchronizing mechanism, according to the present invention;

Figure 19 is an upper schematic view of the synchronizing mechanism of figure 18, where the mechanism is located in a plane ahead of the main frame, while its pivot axis is

located behind it;

Figure 20 is a front view of the synchronizing mechanism of figures 18 and 19 illustrating the elastic device according to the present invention, which purpose will be 5 described below;

Figures 21 and 22 show the two parts which, together form the synchronizing mechanism of figures 18 to 20; and

Figure 23 shows the synchronizing mechanism of figures 18 to 22 when mounted.

10 Figure 1 of the drawings illustrates a cambering scooter 1 according to the prior art, comprising a generally upward main frame 2, having associated to its upper portion a handle bar 3 intended to be engaged by an operator to guide the scooter and attached to its lower portion a front wheel 4.
15 As can be seen from this figure, both the handle bar 3 and the axis 5 of the front wheel 4 are located in the same plane of the said main frame 2.

Extending rearwardly from the lower portion of the said main frame 2 are two twisting arms 6, each having at-
20 tached to its end opposite to the one attached to the main frame a rear wheel 7 and a platform 8 to receive an operator's foot.

Indicated by S in figure 1 is the region where a synchronizing mechanism is provided to attach the twisting
25 arms 6 to the main frame 2. No particular synchronizing mechanism is illustrated in this figure 1, since the prior art provides for many different types of constructions, all of them suffering from the same problems described with regard to documents incorporated in this specification by reference.

30 While the above described configuration is quite common in almost all of the prior art scooters and the results obtained therewith are reasonable, the same causes a great amount of energy supplied by the operator to be lost. In other words, only a small percentage of the operator's force is
35 transformed in forward movement of the scooter.

Referring now to figures 2 to 17, it can be seen that the scooter 10 according to the present invention has the handle bar 13 located in a plane ahead of the plane of the main frame 12 and the axis 15 of the front wheel 14 is located

in a plane behind the said plane of the main frame 12. The handle bar 13 can be fixed to the main frame 12 by a connecting element such as the one indicated in the drawings by the reference number 19 welded to the main frame or by any other appropriate means.

It has been surprisingly found out in the present invention, that the performance of the scooter is highly improved by this disposition, with a much greater percentage of the operator's force being transformed into forward movement of the scooter, when compared to the scooters of the prior art.

Moreover, as can be seen from figure 16, the rear wheels 17 are inclined with regard to the plane of the front wheel 14 by an angle Θ , in a upwardly convergent manner. The said angle Θ is preferably in the range from 2° to 10° with a still more preferable value being 5° .

This construction permits that, when the operator transfers his weight to one of the platforms 18 during operation of the scooter, the rear wheel 17 in that side of the scooter assumes a position close to the vertical, while the other rear wheel 17 is inclined, as is illustrated in figure 17. This characteristic provides an improved performance to the scooter, since it reduces the friction force acting on that rear wheel 17 which is supporting most of the operator's weight, allowing the roller bearings (not shown) to operate in an upward position.

Referring now to figures 2 to 10, a first embodiment of the synchronizing mechanism of the present invention is generally designated as 20. As it can be seen, the synchronizing mechanism 20 is formed by two legs 21 connected by a cross bar 22, in a general "H" configuration and is provided with a pivot axis 23, about which the synchronizing mechanism 20, having engaged thereto the ends of the twisting arms 16 rotate from the rear wheels 17, rotates. The said ends of the twisting arms 16 are welded on respective sleeves 24 which, in turn, are located each on one side of a central fixed sleeve 25 welded in the said main frame 12, with the said pivot axis 23 extending through the three sleeves 24, 25. With this construction, the twisting arms 16 extend through the spaces be-

tween the two legs 21 of the "H", on each side of the cross bar 22 and are held for rotation about the pivot axis 23 by means of the said sleeves 24. The pivot axis 23 has in one of its ends a threaded hole 26 which receives a first locking bolt 27 associated with a handle 28 for retaining the sleeves 24 on the pivot axis 23, while the other end of the pivot axis 23 can be provided with a head or similar (not shown) to complete the retention of the sleeves 24 thereon.

The main frame 12 has a support pin 29 integral therewith and having a threaded hole 30 on its free end, to extend through a hole 31 provided in the cross bar 22 of the synchronizing mechanism 20, so that the synchronizing mechanism can be placed about the said support pin 29 and locked in place by a second locking bolt 32, which is preferably provided with a handle 33. With this construction the synchronizing mechanism 20 can be easily installed and removed.

As already mentioned, it will be noted that figures 2, 7 and 9 illustrate three possible positions of the pivot axis 23 with regard to the main frame 12.

Referring now to figures 18 to 23, a second embodiment of the synchronizing mechanism of the present invention is described, wherein elements similar to those described with regard to figures 2 to 10 are designated by the same reference numbers, to facilitate the comprehension.

As can be seen from figures 18-23, the synchronizing mechanism 40 has a general "H" configuration with two legs 41 and a cross bar 42. The synchronizing mechanism 40 is formed by two pieces 43 and 44 of complementary configurations, each of which is formed by a central piece 45, 46, respectively, provided with a central hole 47 and two of the said legs 41, disposed symmetrically with regard to the central piece 45, 46 so that, when juxtaposed, the two pieces 43 and 44 form the said "H" configuration. This second embodiment of the synchronizing mechanism is also provided with an elastic element 48 disposed between two adjacent legs 41, in order to provide a force tending to approximate the two adjacent legs 41 to each other, thus providing a better holding effect for the twisting arms 16 extending through the said spaces between the legs 41. The synchronizing mechanism 40 is mounted on the

support pin 29 in a manner similar to that described with regard to figures 2-10.

It will be noted from figures 18 and 19 that the synchronizing mechanism 40 can be mounted with two pivot axis 23 parallel to each other, instead of being coaxial as is illustrated in the remaining figures. This disposition provides a more rigid construction and a more accurate adjustment of the pivot axis 23 with regard to the sleeves 24 of the twisting arms 16.

10 In operation, the synchronizing mechanism 20, 40, according to the present invention automatically compensates any inclination of one of the twisting arms with regard to the other, as well as any clearance resulting from wearing of its legs 21, 41.

CLAIMS

1. Cambering scooter comprising a substantially upwardly extending main frame (12) having a pair of substantially horizontal twisting arms (16) extending rearwardly therefrom; a front wheel (14) attached to the said main frame (12) and a pair of rear wheels (17), each attached to one of said twisting arms (16) at their ends opposite to the main frame (12) ; a handle bar (13) associated to the said main frame (12) to allow an operator to rotate the same together with the front wheel (14) attached thereto about the longitudinal axis of the main frame, thus guiding the scooter; and a synchronizing mechanism (20,40) for fixing the said twisting arms (16) to the main frame (12), so that the twisting arms (16) are free to pivot at least in one direction around their points of connection with the said main frame; characterized in that the central axis (15) of the said front wheel (14) is located behind the longitudinal axis of the main frame (12), with regard to the length of the scooter; and the said handle bar (13) is located in a plane ahead of the main frame (12) with regard to the normal direction of movement of the scooter.

2. Cambering scooter according to claim 1, characterized in that the rear wheels (17) are inclined with respect to the plane of the front wheel, in an upwardly convergent manner, by an angle (θ) in the range of 2° to 10° .

3. Cambering scooter according to claim 2 characterized in that the said angle (θ) is of 5° .

4. Synchronizing mechanism (20,40) for attaching the twisting arms (16) to the substantially upwardly extending main frame (12) of a cambering scooter of the type in which the said twisting arms (16) extend rearwardly from the main frame (12), which, in turn, has attached thereto a front wheel (14), while each of said twisting arms (16) has attached thereto a rear wheel (17), characterized in that the said synchronizing mechanism (20,40) has a general "H" configuration, with its cross bar (22,42) being provided with connecting means (31,47) for cooperation with a corresponding connecting means (29) in the main frame (12), and a portion capable of engaging the said twisting arms (16), to limit their movements

with respect to the said main frame (12) and to synchronize the movement of one twisting arm (16) with regard to the other.

5. Synchronizing mechanism according to claim 5, characterized in that an elastic element (48) is provided between two adjacent legs (41) thereof, to provide a force tending to approximate the said legs.

6. Synchronizing mechanism according to claim 4 or 5, characterized in that the same is formed by two pieces (43,44) of complementary configurations, each of which is formed by a central piece (45,46), respectively provided with a central hole (47) and two of the said legs (41), disposed symmetrically with regard to the central piece (45,46) so that, when juxtaposed, the two pieces (43,44) form the synchronizing mechanism.

FIG. 1

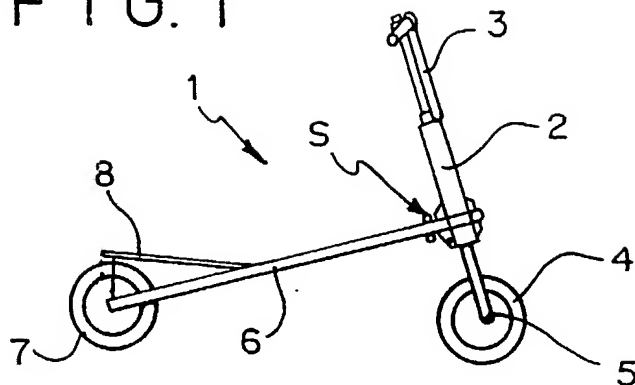
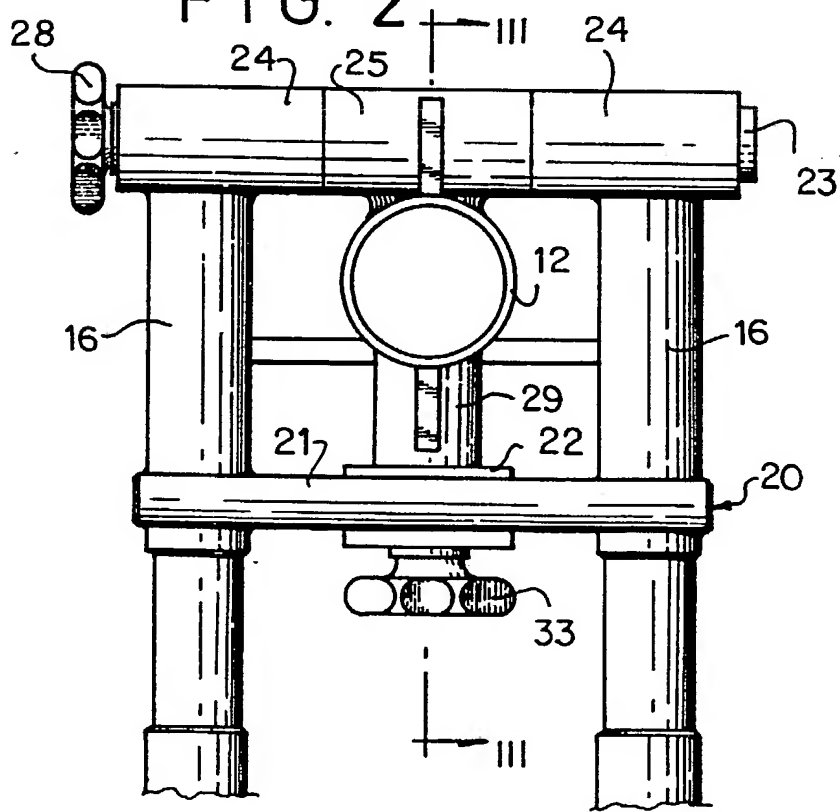


FIG. 2



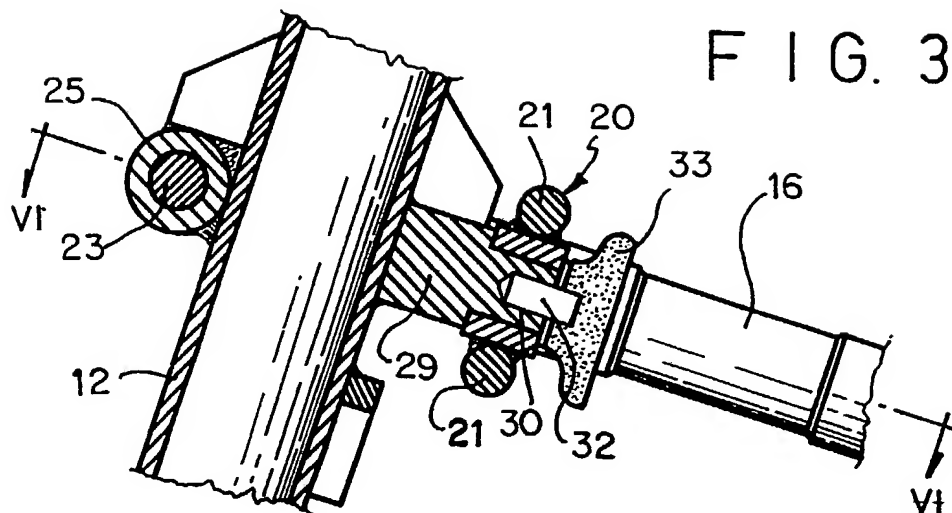


FIG. 3

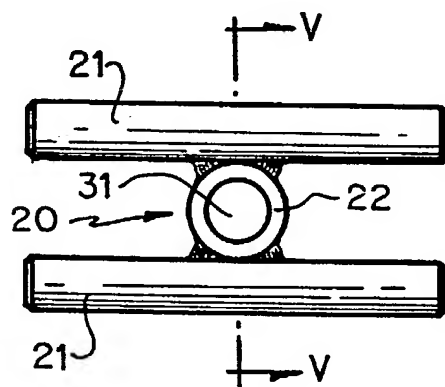


FIG. 4

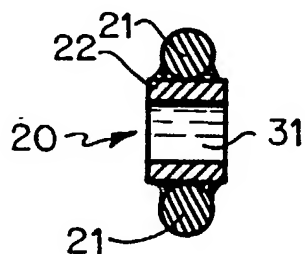


FIG. 5

FIG. 6

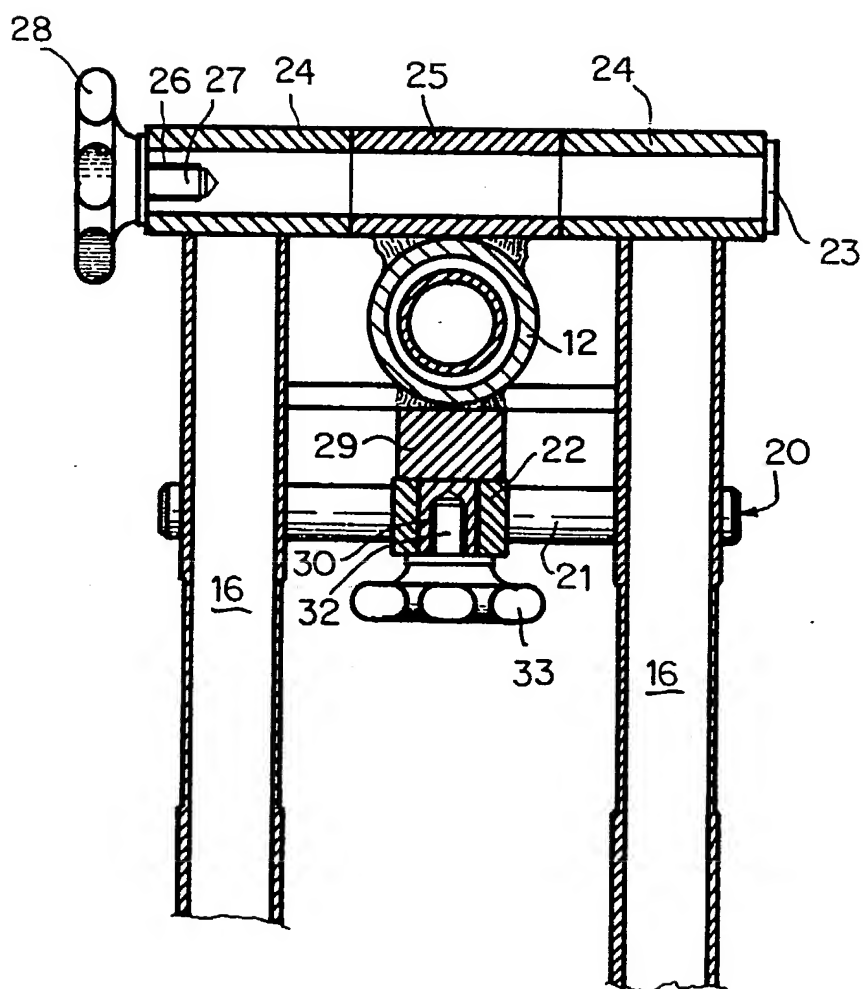


FIG. 7

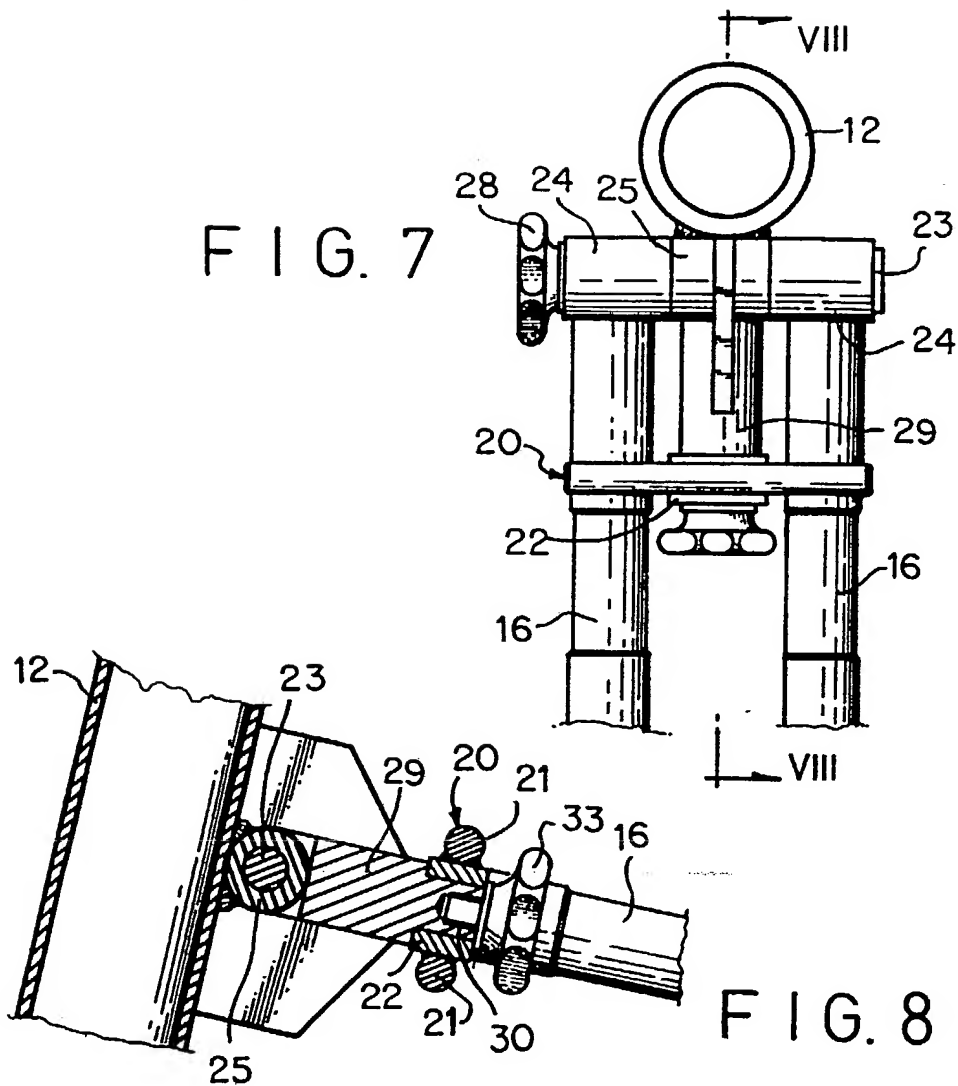


FIG. 8

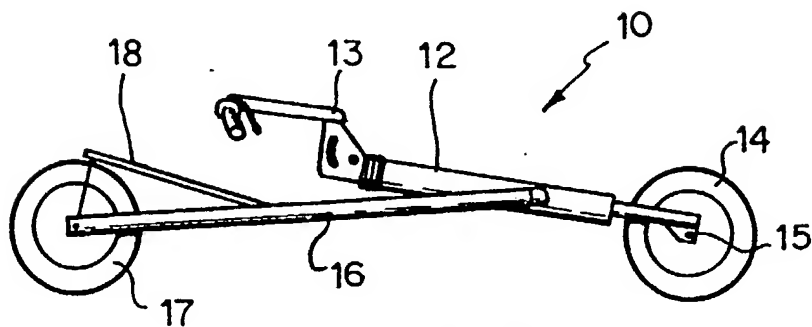
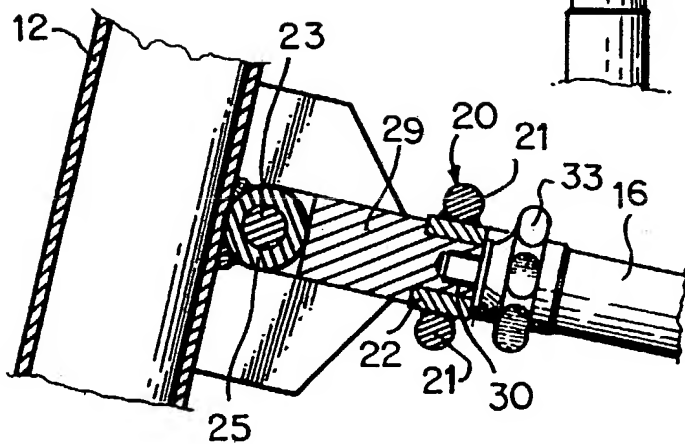


FIG. 11

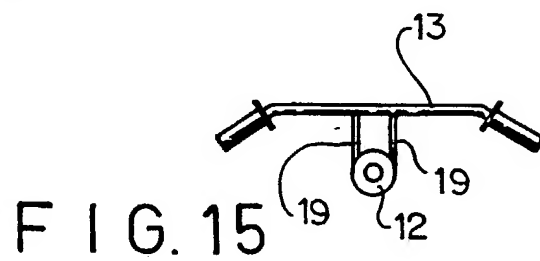
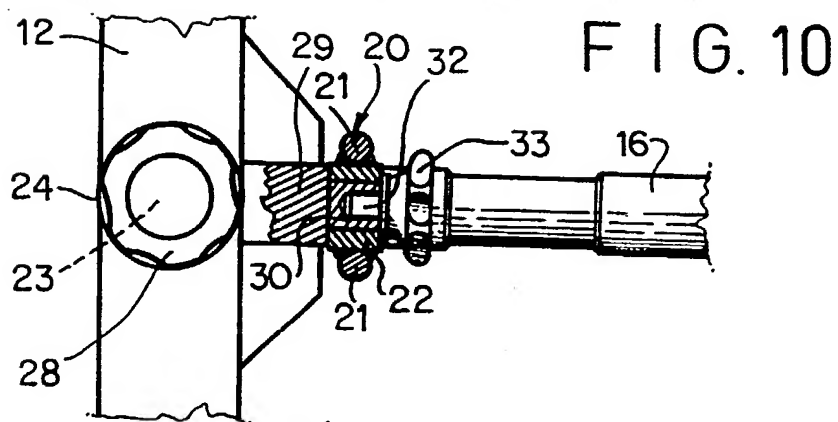
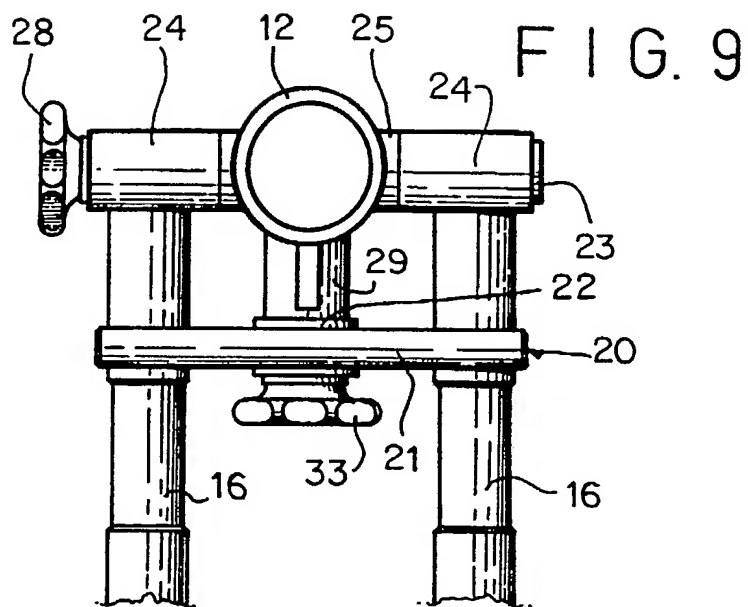


FIG. 12

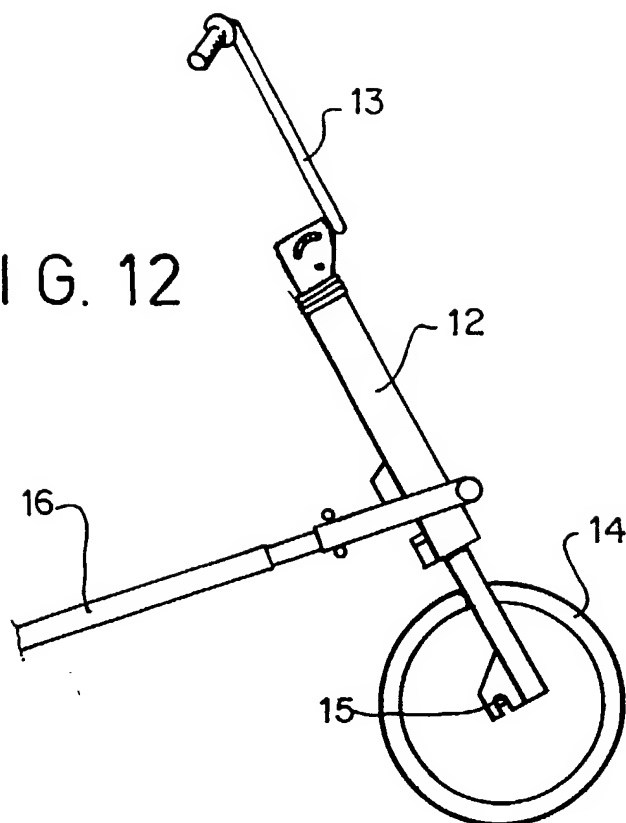


FIG. 16

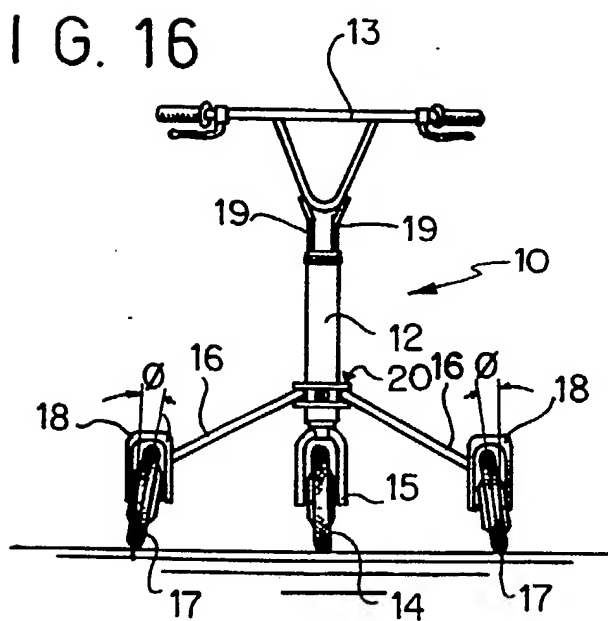


FIG. 13

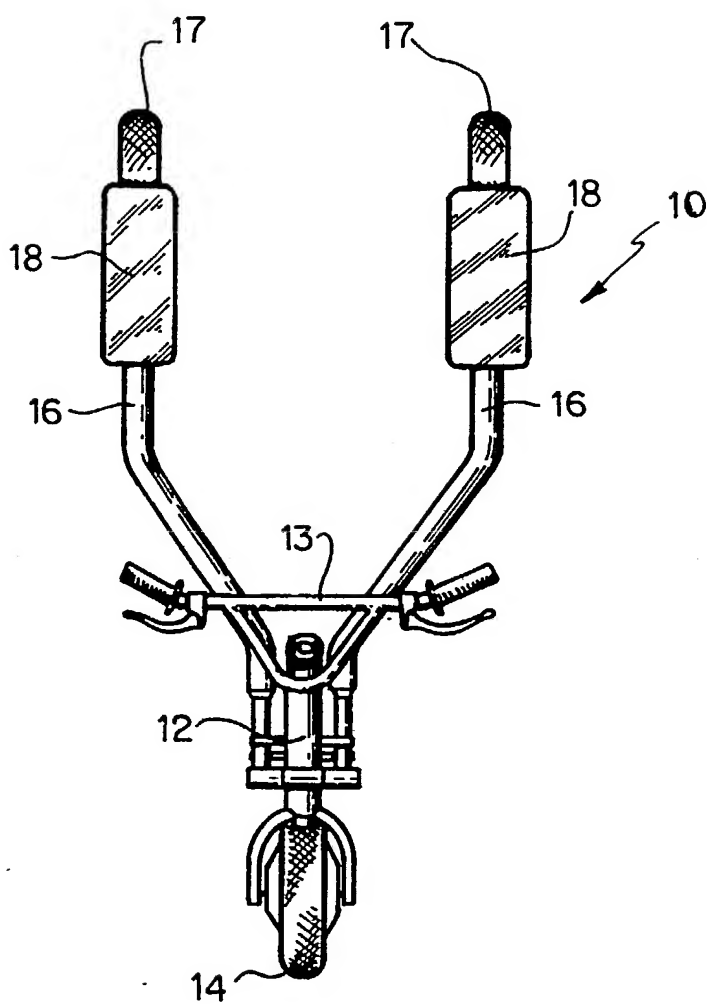


FIG. 14

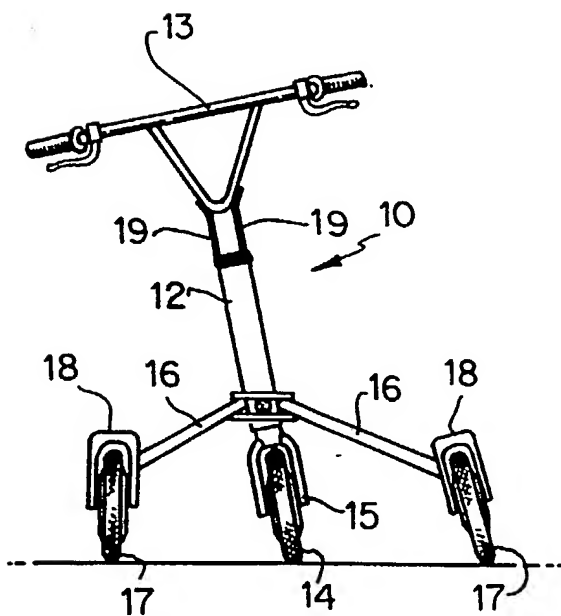
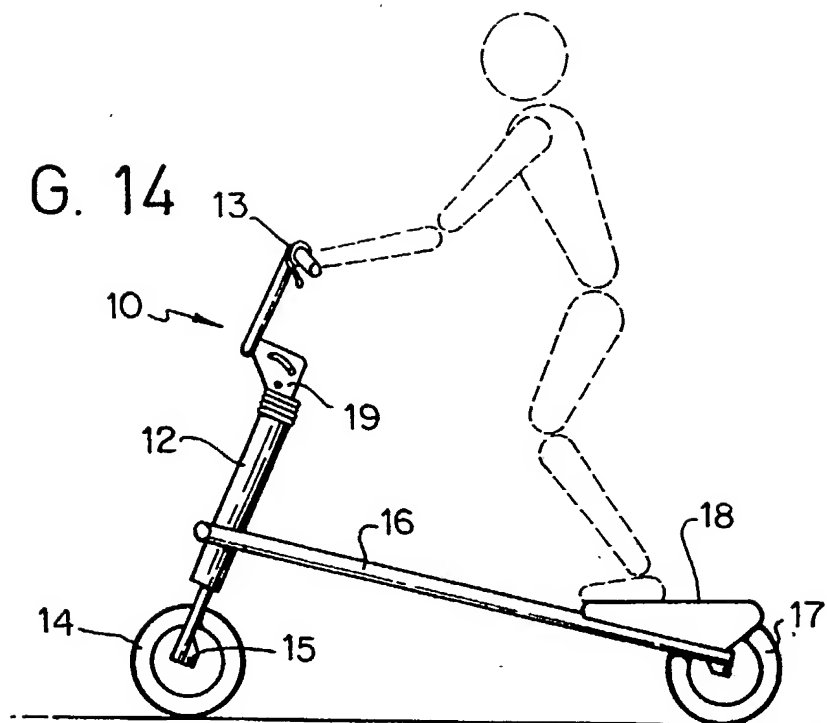


FIG. 17

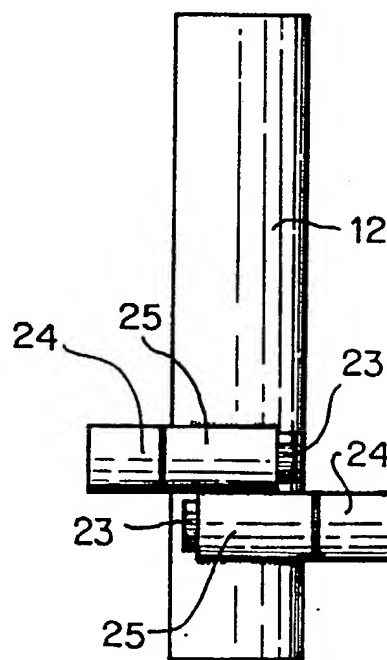


FIG. 18

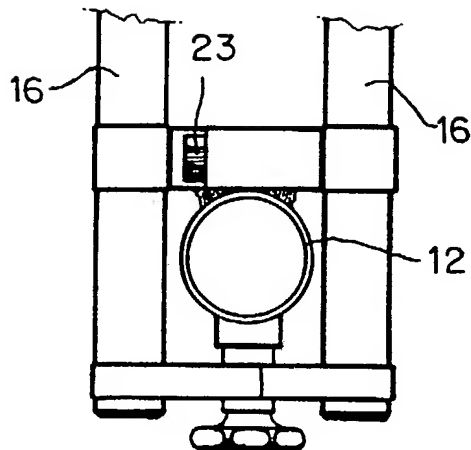


FIG. 19

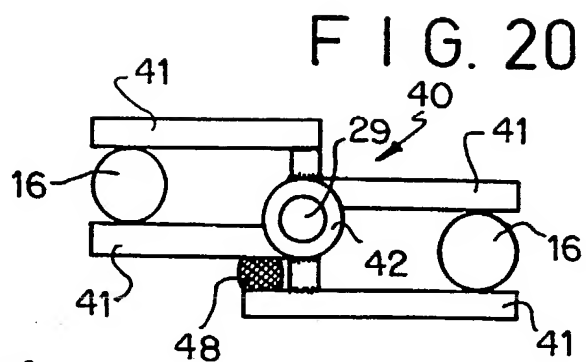


FIG. 20

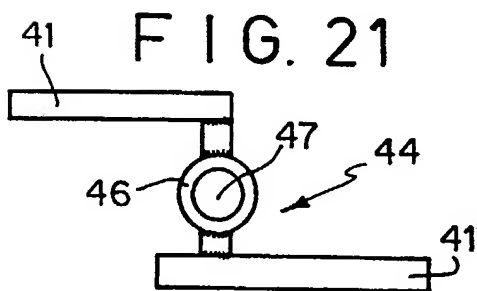


FIG. 21

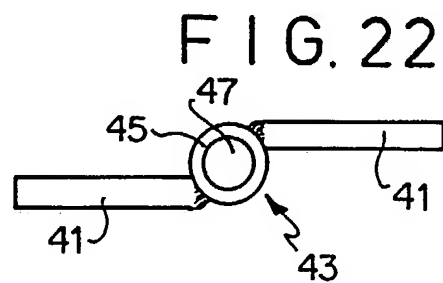


FIG. 22

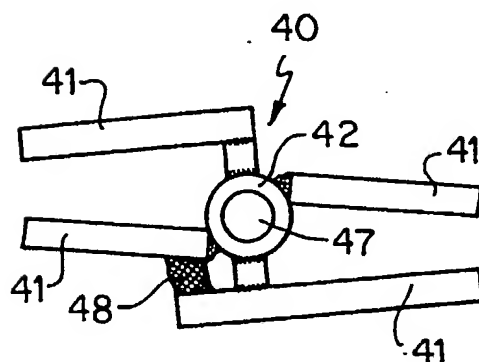



FIG. 23

INTERNATIONAL SEARCH REPORT

PCT/BR 91/00011

International Application No

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5 B62K5/08		
II. FIELDS SEARCHED		
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Classification System	Classification Symbols	
Int.Cl. 5	B62K	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with Indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	DE,C,813 101 (O.KROLL) July 12, 1951 see the whole document	1
Y	US,A,4 065 146 (R.E.DENZER) December 27, 1977 see the whole document	1
A	US,A,4 572 535 (B.C.STEWART) February 25, 1986 see column 4, line 62 - column 4, paragraph 65; figures	1-3
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Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
17 SEPTEMBER 1991	03. 10. 91	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	FRANKS B.G. 	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
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